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6. Proposed by B. F. FINKEL, Professor of Mathematics in Kidder Institute, Kidder, Missouri.

What is the volume of a regular pentagonal pyramid, each side of whose base is 10 feet and the altitude 20 feet?

7. If an article had cost me 10% less, the gain would have been 12% more; what was the gain per cent.? [Selected from *Brook's Higher Arithmetic*.]

8. Proposed by EARL D. WEST, West Middleburg, Logan County, Ohio.

The number of men in a side rank of a solid body of militia is to the number of men in the front rank as 2 is to 3; if the length and breadth be increased so as to number each 4 men more, the whole body will then contain 2320 men. How many men in the militia?

9. Proposed by O. S. KIBLER, Superintendent of Schools, West Middleburg, Logan County, Ohio.

Four logs of uniform thickness whose diameters are each 4 feet, lie side by side and touch each other. In the crevices of these logs lie three logs 3 feet in diameter, and in the crevices of the three logs lie two logs whose diameters are 2 feet. What must be the diameter of a log to lie on the top of the pile and touch the two logs and the middle one of the three logs?

10. Proposed by MISS LEOTA MILLER, B. L., Professor of Natural Science and Art, Kidder Institute, Kidder, Missouri.

A carpenter is obliged to cut a board, that is in the form of a trapezoid, crosswise into two equivalent parts. The board is 12 ft. long, 2 ft. wide at one end, and one foot wide at the other. How far from the narrow end must he cut?

11. Proposed by L. B. HAYWARD, Superintendent of Schools, Bingham, Ohio.

What length of rope will be required to draw water from a well, it being 38 feet to the water, the sweep to be supported by an upright post 20 feet high, and standing 20 feet from the well, and the foot of the sweep to strike the ground 20 feet from the foot of the upright post?

ALGEBRA.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

1. Proposed by W. L. HARVEY, Portland, Maine.

$(2x^2 - 1)^2 - (2x^2 - 4x - 1)(2x^2 - 1) = 1$; find the value of x by quadratics.

Solution by the Proposer.

Performing the operations indicated and collecting, the equation reduces to $8x^3 - 4x = 1$. Multiplying both sides of this equation by $8x$ and adding $16x^2 + 1$ to both sides of the resulting equation, we have $64x^4 - 16x^2 + 1 = 16x^2 + 8x + 1$, from which $8x^2 - 1 = 4x + 1$. Then $8x^2 - 4x = 2$, from which $x = \frac{1}{4}(1 \pm \sqrt{5})$. Using the minus sign this will prove true.

2. Proposed by Professor P. H. PHILBRIK, C. E., Lake Charles, Louisiana.

Find x from the equation, $x^3 + 18x = 1529$.

Solution by the Proposer.

Multiply by x , then $x^4 + 18x^2 = 1529x = 139 \times 11x$. Again, $x^4 + 139x^2 +$

$$\left[\frac{139}{2}\right]^2 = 121x^2 + 139 \times 11x + \left[\frac{139}{2}\right]^2. \quad \text{Extract square root and have,}$$

$$x^2 + \frac{139}{2} = 11x + \frac{139}{2} \quad \text{or } x^2 = 11x.$$

PROBLEMS.

3. Proposed by Professor H. A. WOOD, A. M., Hoboken, New Jersey.

If $x^6 - y^6 = 665$, and $x^3y + xy^3 = 78$, find x and y .

4. Proposed by L. E. PRATT, Tecumseh, Nebraska.

If Σm , Σm^2 , Σm^3 , ..., Σm^{2n-1} are the sums of the 1st, 3rd, 5th, ... $(2n-1)$ th powers of the first m natural numbers, prove that $n \Sigma m^{2n-1} + \frac{n(n-1)(n-2)}{3} \Sigma m^{2n-3} + \frac{n(n-1)(n-2)(n-3)(n-4)}{5} \Sigma m^{2n-5} + \dots = 2^{n-1} \Sigma_m^n$.

5. Proposed by WILLIAM E. MAY, Jonesboro, Tennessee.

A, B, and C went to market, each with 10, 30, and 50 eggs, respectively. On their way to market, they agreed to sell their eggs at the same price per dozen so as to realize an equal integral number of cents. How much did they receive?

6. Proposed by L. E. PRATT, Tecumseh, Nebraska.

A vessel is to be filled with water by two pipes. The first pipe is kept open during m -nth of the time which the second would take to fill the vessel; then the first pipe is closed and the second is opened. If the two pipes had kept open together, the vessel would have been filled t hours sooner, and the first pipe would have brought in p -qth of the quantity of water which the second pipe really brought in. How long would it take each pipe alone to fill the vessel?

7. Proposed by O. S. KIBLER, Superintendent of Schools, West Middleburg, Logan county, Ohio.

A's age equals B's age plus the cube root of C's age; B's age equals C's age plus the cube root of A's age plus 14 years; and, C's age equals the cube root of A's age plus the square root of B's age. What is the age of each?

8. Proposed by H. M. CASH, Salesville, Ohio.

The longer side BC of a field in the form of a parallelogram is a (78) rods; the sum of its shorter side AB , and greater diagonal AC is b (114) rods; the distance from B at right angles with AB to a tree standing on AC , is c (32) rods. Find the area of the field, and the distance from the tree to the corners A , C , and D .

GEOMETRY.

Conducted by B. F. FINKEL, Kidder, Missouri. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

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